Formelsamling Ellära FY502G

Konstanter: $e = 1.602 \cdot 10^{-19}\ [\mathrm{C}]$ $\varepsilon_0 = 8.8541878176 \cdot 10^{-12}\ [\mathrm{F/m}]$ $\mu_0 = 4\pi \cdot 10^{-7}\ [\mathrm{N/A^2}]$

Ohms, Joules och Kirchhoffs lagar etc: $R = \frac{U}{I}$ $P = UI$ $\sum_{k=1}^{N} I_k = 0$ $\sum_{k=1}^{M} U_k = 0$ $G = \frac{1}{R}$

Ledning: $R_l = \rho \frac{L}{A}$

Kapacitans: $C = \frac{Q}{U}[\mathrm{F}]$ $U_C(t) = \frac{1}{C}\int_0^t I(\tau)d\tau$ $W_C = \frac{CU_C^2}{2}$ för plattkondensator: $C = \varepsilon_0 \varepsilon_r \frac{A}{d}[\mathrm{F}]$

Induktans: $L = N\frac{\Phi}{I}[\mathrm{H}]$ $U_L(t) = L\frac{dI(t)}{dt}$ $W_L = \frac{LI_L^2}{2}$ för solenoid: $L = \mu_0 \mu_r \frac{N^2 A}{l}[\mathrm{H}]$

Växelspänning: $u_{RMS} = u_{eff} = \frac{\hat{u}}{\sqrt{2}}$ $i_{RMS} = i_{eff} = \frac{\hat{i}}{\sqrt{2}}$ $f = \frac{1}{T}[\mathrm{Hz}]$ $\omega = 2\pi f\ [\mathrm{rad/s}]$

Effekt: $S = u_{eff} i_{eff}\ [\mathrm{VA}]$ $P = S\cos(\phi)[\mathrm{W}]$ $Q = S\sin(\phi)[\mathrm{VAr}]$

Komplex effekt, om **effektivvärden** (rms) används: $\tilde{S} = \tilde{U}\tilde{I}^*\ [\mathrm{VA}]$

om **toppvärden** används: $\tilde{S} = \frac{1}{2}\tilde{U}\tilde{I}^*\ [\mathrm{VA}]$

Komplexa impedanser: $\tilde{Z} = R + jX$ $\tilde{Z}_R = R$ $\tilde{Z}_C = -jX_C = -j\frac{1}{\omega C} = -j\frac{1}{2\pi f C}$ $\tilde{Z}_L = jX_L = j\omega L = j2\pi f L$

Trefas: $U_h = \sqrt{3}U_f$

Faradays induktionslag: $E = N\frac{d\Phi}{dt}$

Coulombs kraftlag: $F = \frac{1}{4\pi\varepsilon}\frac{Q_1 Q_2}{r^2}[\mathrm{N}]$

Faradays kraftlag: $\frac{F}{L} = \frac{\mu I_1 I_2}{2\pi r}[\mathrm{N}]$

$\varepsilon = \varepsilon_0 \varepsilon_r$

$\mu = \mu_0 \mu_r$

Ideal transformator: $\frac{U_2}{U_1} = \frac{N_2}{N_1}$ $\frac{I_1}{I_2} = \frac{N_2}{N_1}$ $\frac{Z_2}{Z_1} = \left(\frac{N_2}{N_1}\right)^2$

Decibel: $H_{dB} = 10\log\left(\frac{P_2}{P_1}\right) = 20\log\left(\frac{U_2}{U_1}\right)$

Eulers formel: $e^{j\alpha} = \cos(\alpha) + j\sin(\alpha)$ $j = \sqrt{-1}$

Kartesiskt/polärt: $A = a + jb$ $|A| = \sqrt{a^2 + b^2}$ $\angle A = \arctan\left(\frac{b}{a}\right)$

$a = |A|\cos(\angle A)$

$b = |A|\sin(\angle A)$

vänd!

Serieresonanskrets

Överdämpat system: $\zeta > 1 \quad I(t) = a\left(\frac{1}{r_1 - r_2}e^{r_1 t} + \frac{1}{r_2 - r_1}e^{r_2 t}\right)$ $\quad r_1 = -\omega_0\left(\zeta - \sqrt{\zeta^2 - 1}\right)$ $\quad r_2 = -\omega_0\left(\zeta + \sqrt{\zeta^2 - 1}\right)$

Kritiskt dämpat system: $\zeta = 1 \quad I(t) = ate^{rt} \quad r = r_1 = r_2 = -\omega_0$

Underdämpat system: $\zeta < 1 \quad I(t) = ae^{-\omega_0 \zeta t}\sin(\omega_d t)$

Odämpad resonansfrekvens: $\omega_0 = \frac{1}{\sqrt{LC}}$

Dämpad resonansfrekvens: $\omega_d = \omega_0\sqrt{1 - \zeta^2}$

Dämpfaktor: $\zeta = \frac{R}{2}\sqrt{\frac{C}{L}}$

RC-nät $\tau = RC \quad U_C(t) = E\left(1 - e^{-\frac{1}{RC}t}\right) \quad U_C(t) = Ee^{-\frac{1}{RC}t}$

RL-nät $\tau = \frac{L}{R} \quad I(t) = \frac{E}{R}\left(1 - e^{-\frac{R}{L}t}\right) \quad I(t) = \frac{E}{R}e^{-\frac{R}{L}t}$